film or heat the low-crystal-quality thin semiconductor film while maintaining it in a non-melted state and then cool the low-crystal-quality thin semiconductor film thereby enhancing crystallization of the low-crystal-quality thin semiconductor film.

3. A method according to Claim 1 or 2, wherein the first and second steps are performed repeatedly.

4. A method according to Claim 1 or 2, wherein the focused-light annealing is performed by scanning a focused light ray emitted from a lamp across the substrate such that zone melting recrystallization occurs or by successively scanning a plurality of focused light rays emitted from a plurality of lamps across the substrate such that multiple zone melting recrystallization occurs.

5. A method according to Claim 4, wherein the scanning is performed by moving the focused light ray(s) emitted from the lamp(s) while maintaining the substrate at a fixed location or by moving the substrate while maintaining the focused light ray(s) at a fixed location.

6. A method according to Claim 1 or 2, wherein the light emitted from the lamp is separated into an ultraviolet

component, a visible component, and an infrared component, and the substrate is illuminated successively with the separated components that are scanned in the order of the visible component, the infrared component, and the ultraviolet component.

7. A method according to Claim 1 or 2, wherein hot air or gas is blown against the front or back side or against both the front and back sides of the substrate during the focused-light annealing process.

8. A method according to Claim 1 or 2, wherein a proper amount of at least one kind of catalytic element is incorporated into the low-crystal-quality thin semiconductor film, and the second step is performed on the low-crystal-quality thin semiconductor film containing the at least one kind of catalytic element.

9. A method according to Claim 1 or 2, wherein the low-crystal-quality thin semiconductor film is converted into a large-grain polycrystalline form by performing the focused-light annealing.

10. A method according to Claim 1 or 2, further comprising the step of forming a stepped recess with a

predetermined shape and size in a particular area of the substrate where a device is to be formed,

wherein the first step includes forming a low-crystal-quality thin semiconductor film, which may or may not include one or more kinds of catalytic elements, on the substrate having the stepped recess, and the second step includes performing a focused-light annealing process such that graphoepitaxy growth occurs from lower edges of the stepped recess acting as growth seeds thereby converting the low-crystal-quality thin semiconductor film into the monocrystalline thin semiconductor film.

11. A method according to Claim 1 or 2, further comprising the step of forming a layer of a material such as sapphire well lattice-matched with the monocrystalline semiconductor in an area of the substrate where a device is to be formed, wherein the first step includes forming a low-crystal-quality thin semiconductor film, which may or may not include one or more kinds of catalytic elements, on the crystal layer, and the second step includes performing a focused-light annealing process such that heteroepitaxy growth occurs on the layer acting as a growth seed thereby converting the low-crystal-quality thin semiconductor film into the monocrystalline thin semiconductor film.

12. A method according to Claim 1 or 2, wherein the first and second steps are performed continuously or sequentially using an apparatus constructed in an integral fashion so as to be capable of performing at least the first and second steps.

13. A method according to Claim 3, further comprising the step of, before again performing the focused-light annealing, cleaning the surface of the polycrystalline thin semiconductor film or removing a low-quality oxide film from the surface of the polycrystalline thin semiconductor film by applying, to the polycrystalline thin semiconductor film, a hydrogen-based active species created by means of plasma discharge of hydrogen or a gas containing hydrogen or by means of a catalytic reaction, wherein, after completion of the cleaning step, a low-crystal-quality thin semiconductor film is formed and focused-light annealing is performed.

14. A method according to Claim 1 or 2, wherein the focused-light annealing is performed in an ambient of reduced-pressure hydrogen, a gas containing reduced-pressure hydrogen, a vacuum, air, or an atmospheric-pressure nitrogen.

15. A method according to Claim 1 or 2, wherein in the focused-light annealing, the substrate is heated to a

temperature lower than the strain point of the substrate.

16. A method according to Claim 1 or 2, further comprising the step of forming a protective insulating film on the low-crystal-quality thin semiconductor film, wherein the focused-light annealing is performed on the low-crystal-quality thin semiconductor film having the protective insulating film formed thereon in an ambient of the air or atmospheric-pressure nitrogen.

17. A method according to Claim 1 or 2, wherein when the focused-light annealing is performed on the low-crystal-quality thin semiconductor film formed on the substrate or when the focused-light annealing is performed on the low-crystal-quality thin semiconductor film coated with a protective insulating film, the substrate is illuminated with the focused light ray emitted from the lamp from above or from below or from both above and below the substrate (wherein the substrate is adapted to be transparent to wavelengths smaller than 400 nm when the light is applied from below).

18. A method according to Claim 17, wherein the low-crystal-quality thin semiconductor film or the low-crystal-quality thin semiconductor film coated with the protective

insulating film is formed into the shape of one or more islands.

19. A method according to Claim 17, wherein the illumination of the focused light ray is performed in an ambient of atmospheric-pressure nitrogen or in the air.

20. A method according to Claim 17, wherein the illumination of the focused light ray is performed in an ambient of reduced-pressure hydrogen, a gas containing reduced-pressure hydrogen, or a vacuum.

21. A method according to Claim 1 or 2, wherein the focused-light annealing is performed while applying a magnetic or electric field.

22. A method according to Claim 1 or 2, wherein the low-crystal-quality thin semiconductor film is a film of amorphous silicon, a film of amorphous silicon containing microcrystalline silicon, a film of microcrystalline silicon (containing amorphous silicon), a film of polycrystalline silicon containing amorphous silicon and microcrystalline silicon, a film of amorphous germanium a film of amorphous germanium containing microcrystalline germanium, a film of microcrystalline germanium (containing amorphous germanium,

a film of polycrystalline germanium containing amorphous germanium and microcrystalline germanium, a film of amorphous silicon germanium having a composition of Si_xGe_{1-x} $(0 < x < 1)$, a film of amorphous carbon, a film of amorphous carbon containing microcrystalline carbon, a film of microcrystalline carbon (containing amorphous carbon), a film of polycrystalline carbon containing amorphous carbon and microcrystalline carbon, a film of amorphous silicon carbon having a composition of Si_xC_{1-x} $(0 < x < 1)$, or a film of amorphous gallium arsenide having a composition of Ga_xAs_{1-x} $(0 < x < 1)$.

23. A method according to Claim 1 or 2, further comprising the step of forming a channel region, a source region, and a drain region of a thin-film insulated-gate field effect transistor or forming a diode, an interconnection, a resistor, a capacitor, or an electron emission element, using the thin monocrystalline or polycrystalline semiconductor film.

24. A method according to Claim 23, wherein the focused-light annealing is performed after patterning the low-crystal-quality thin semiconductor film into a form (of one or more islands) corresponding to the channel region, the source region, the drain region, the diode, the resistor,

the capacitor, the interconnection, or the electron emission element.

25. A method according to Claim 1 or 2, wherein the thin film for use in a silicon semiconductor device, a silicon semiconductor integrated circuit, a silicon-germanium semiconductor device, a silicon-germanium semiconductor integrated circuit, a compound semiconductor device, a compound semiconductor integrated circuit, a silicon carbide semiconductor device, a silicon carbide semiconductor integrated device, a polycrystalline diamond semiconductor device, a polycrystalline diamond semiconductor integrated circuit, a liquid crystal display, an organic or inorganic electroluminescence (EL) display, a field emission display (FED), a light emitting polymer display, a light emitting diode display, a CCD area/liner sensor, a CMOS sensor, or a solar cell is produced.

26. A method according to Claim 25, wherein when a device such as a semiconductor device, an electro-optical display, or a solid-state imaging device, which includes an internal circuit and a peripheral circuit, is produced, a channel region, a source region, and a drain region of a thin-film insulated-gate field effect transistor of at least one of the internal circuit and the peripheral circuit are

formed using the polycrystalline or monocrystalline thin semiconductor film.

27. A method according to Claim 26, wherein a cathode or an anode is disposed in a layer under an organic or inorganic electroluminescence layer of each color, wherein the cathode or the anode is connected to the drain or the source of the thin-film insulated-gate field effect transistor.

28. A method according to Claim 27, wherein active elements including the thin-film insulated-gate field effect transistor and a diode are covered with the cathode, or the surfaces of the organic or inorganic electroluminescence layers of respective colors and all areas between the organic or inorganic electroluminescence layers are covered with the cathode or the anode.

29. A method according to Claim 27, wherein a black mask layer is formed in areas between the organic or inorganic electroluminescence layers of respective colors.

30. A method according to Claim 26, wherein an emitter of a field emission display device is connected to a drain of the thin-film insulated-gate field effect transistor via

the polycrystalline or monocrystalline thin semiconductor film, and wherein the emitter of the field emission display device is formed of an n-type polycrystalline semiconductor film or an n-type polycrystalline diamond film formed on the polycrystalline or monocrystalline thin semiconductor film.

31. A method according to Claim 30, wherein a shield metal film for providing a ground potential is formed, via an insulating film, on active elements including the thin-film insulated-gate field effect transistor and diode.

32. A method according to Claim 31, wherein the shield metal film is formed using the same material as that of the gate lead electrode of the field emission display in the same processing step as that in which the gate lead electrode of the field emission display is formed.

33. A thin semiconductor film formation apparatus for forming a polycrystalline or monocrystalline thin semiconductor film on a substrate, the apparatus comprising:

first means for forming a low-crystal-quality thin semiconductor film on the substrate; and

second means for performing focused-light annealing on the low-crystal-quality thin semiconductor film so as to melt or semi-melt the low-crystal-quality thin semiconductor

film or heat the low-crystal-quality thin semiconductor film while maintaining it in a non-melted state and then cool the low-crystal-quality thin semiconductor film thereby enhancing crystallization of the low-crystal-quality thin semiconductor film.

34. A semiconductor device production apparatus for producing a semiconductor device including a polycrystalline or monocrystalline thin semiconductor film disposed on a substrate, the apparatus comprising:

first means for forming a low-crystal-quality thin semiconductor film on the substrate; and

second means for performing focused-light annealing on the low-crystal-quality thin semiconductor film so as to melt or semi-melt the low-crystal-quality thin semiconductor film or heat the low-crystal-quality thin semiconductor film while maintaining it in a non-melted state and then cool the low-crystal-quality thin semiconductor film thereby enhancing crystallization of the low-crystal-quality thin semiconductor film.

35. An apparatus according to Claim 33 or 34, wherein the first and second means are used repeatedly.

36. An apparatus according to Claim 33 or 34, wherein

the focused-light annealing is performed by scanning a focused light ray emitted from a lamp across the substrate such that zone melting recrystallization occurs or by successively scanning a plurality of focused light rays emitted from a plurality of lamps across the substrate such that multiple zone melting recrystallization occurs.

37. An apparatus according to Claim 36, wherein the scanning is performed by moving the focused light ray(s) emitted from the lamp(s) while maintaining the substrate at a fixed location or by moving the substrate while maintaining the focused light ray(s) at a fixed location.

38. An apparatus according to Claim 33 or 34, wherein the light emitted from the lamp is separated into an ultraviolet component, a visible component, and an infrared component, and the substrate is illuminated successively with the separated components that are scanned in the order of the visible component, the infrared component, and the ultraviolet component.

39. An apparatus according to Claim 33 or 34, wherein hot air or gas is blown against the front or back side or against both the front and back sides of the substrate during the focused-light annealing process.

40. An apparatus according to Claim 33 or 34, further comprising means for incorporating a proper amount of at least one kind of catalytic element into the low-crystal-quality thin semiconductor film.

41. An apparatus according to Claim 33 or 34, wherein at least the first and second means are disposed in an integrated fashion in a unit so as to be capable of using the first and second means continuously or successively.

42. An apparatus according to Claim 35, further comprising means for, before again performing the focused-light annealing, cleaning the surface of the polycrystalline thin semiconductor film or removing a low-quality oxide film from the surface of the polycrystalline thin semiconductor film by applying, to the polycrystalline thin semiconductor film, a hydrogen-based active species created by means of plasma discharge of hydrogen or a gas containing hydrogen or by means of a catalytic reaction.

43. A method according to Claim 33 or 34, wherein the focused-light annealing is performed in an ambient of reduced-pressure hydrogen, a gas containing reduced-pressure hydrogen, a vacuum, air, or an atmospheric-pressure nitrogen.

44. An apparatus according to Claim 33 or 34, wherein in the focused-light annealing, the substrate is heated to a temperature lower than the strain point of the substrate.

45. An apparatus according to Claim 33 or 34, wherein forming a protective insulating film on the low-crystal-quality thin semiconductor film, wherein the focused-light annealing is performed on the low-crystal-quality thin semiconductor film having the protective insulating film formed thereon in an ambient of the air or atmospheric-pressure nitrogen.

46. An apparatus according to Claim 33 or 34, wherein when the focused-light annealing is performed on the low-crystal-quality thin semiconductor film formed on the substrate or when the focused-light annealing is performed on the low-crystal-quality thin semiconductor film coated with a protective insulating film, the substrate is illuminated with the focused light ray emitted from the lamp from above or from below or from both above and below the substrate (wherein the substrate is adapted to be transparent to wavelengths smaller than 400 nm when the light is applied from below).

47. An apparatus according to Claim 46, wherein the low-crystal-quality thin semiconductor film or the low-crystal-quality thin semiconductor film coated with the protective insulating film is formed into the shape of one or more islands.

48. An apparatus according to Claim 46, wherein the illumination of the focused light ray is performed in an ambient of atmospheric-pressure nitrogen or in the air.

49. An apparatus according to Claim 46, wherein the illumination of the focused light ray is performed in an ambient of reduced-pressure hydrogen, a gas containing reduced-pressure hydrogen, or a vacuum.

50. An apparatus according to Claim 33 or 34, wherein the focused-light annealing is performed while applying a magnetic or electric field.

51. An apparatus according to Claim 33 or 34, wherein the low-crystal-quality thin semiconductor film is a film of amorphous silicon, a film of amorphous silicon containing microcrystalline silicon, a film of microcrystalline silicon (containing amorphous silicon), a film of polycrystalline silicon containing amorphous silicon and microcrystalline

silicon, a film of amorphous germanium a film of amorphous germanium containing microcrystalline germanium, a film of microcrystalline germanium (containing amorphous germanium, a film of polycrystalline germanium containing amorphous germanium and microcrystalline germanium, a film of amorphous silicon germanium having a composition of Si_xGe_{1-x} $(0 < x < 1)$, a film of amorphous carbon, a film of amorphous carbon containing microcrystalline carbon, a film of microcrystalline carbon (containing amorphous carbon), a film of polycrystalline carbon containing amorphous carbon and microcrystalline carbon, a film of amorphous silicon carbon having a composition of Si_xC_{1-x} $(0 < x < 1)$, or a film of amorphous gallium arsenide having a composition of Ga_xAs_{1-x} $(0 < x < 1)$.

52. An apparatus according to Claim 33 or 34, wherein forming a channel region, a source region, and a drain region of a thin-film insulated-gate field effect transistor or forming a diode, an interconnection, a resistor, a capacitor, or an electron emission element, using the thin monocrystalline or polycrystalline semiconductor film.

53. An apparatus according to Claim 52, wherein the focused-light annealing is performed after patterning the low-crystal-quality thin semiconductor film into a form (of

one or more islands) corresponding to the channel region, the source region, the drain region, the diode, the resistor, the capacitor, the interconnection, or the electron emission element.

54. An apparatus according to Claim 33 or 34, wherein the apparatus produces a thin film for use in a silicon semiconductor device, a silicon semiconductor integrated circuit, a silicon-germanium semiconductor device, a silicon-germanium semiconductor integrated circuit, a compound semiconductor device, a compound semiconductor integrated circuit, a silicon carbide semiconductor device, a silicon carbide semiconductor integrated device, a polycrystalline diamond semiconductor device, a polycrystalline diamond semiconductor integrated circuit, a liquid crystal display, an organic or inorganic electroluminescence (EL) display, a field emission display (FED), a light emitting polymer display, a light emitting diode display, a CCD area/liner sensor, a CMOS sensor, or a solar cell.

55. An apparatus according to Claim 54, wherein when a device such as a semiconductor device, an electro-optical display, or a solid-state imaging device, which includes an internal circuit and a peripheral circuit, is produced, a

channel region, a source region, and a drain region of a thin-film insulated-gate field effect transistor of at least one of the internal circuit and the peripheral circuit are formed using the polycrystalline or monocrystalline thin semiconductor film.

56. An apparatus according to Claim 55, wherein a device including a cathode or an anode disposed in a layer under an organic or inorganic electroluminescence layer of each color and connected to the drain or the source of the thin-film insulated-gate field effect transistor is produced.

57. An apparatus according to Claim 56, wherein active elements including the thin-film insulated-gate field effect transistor and a diode are covered with the cathode, or the surfaces of the organic or inorganic electroluminescence layers of respective colors and all areas between the organic or inorganic electroluminescence layers are covered with the cathode or the anode.

58. An apparatus according to Claim 56, wherein a black mask layer is formed in areas between the organic or inorganic electroluminescence layers of respective colors.

59. An apparatus according to Claim 55, wherein an

emitter of a field emission display device is connected to a drain of the thin-film insulated-gate field effect transistor via the polycrystalline or monocrystalline thin semiconductor film, and wherein the emitter of the field emission display device is formed of an n-type polycrystalline semiconductor film or an n-type polycrystalline diamond film formed on the polycrystalline or monocrystalline thin semiconductor film.

60. An apparatus according to Claim 59, wherein a shield metal film for providing a ground potential is formed, via an insulating film, on active elements including the thin-film insulated-gate field effect transistor and diode.

61. An apparatus according to Claim 60, wherein the shield metal film is formed using the same material as that of the gate lead electrode of the field emission display in the same processing step as that in which the gate lead electrode of the field emission display is formed.

62. An electro-optical device including a cathode or an anode disposed under organic or inorganic electroluminescent layers of respective colors and connected to a drain or a source of a thin-film insulated-gate field effect transistor formed of a polycrystalline or

monocrystalline wherein said thin semiconductor film comprises an annealed low-crystal quality-thin semiconductor film having enhanced crystallization, wherein active elements including the thin-film insulated-gate field effect transistor and a diode are covered with the cathode, or the surfaces of the organic or inorganic electroluminescence layers of respective colors and all areas between the organic or inorganic electroluminescence layers are covered with the cathode or the anode.

63. An electro-optical device according to Claim 62, whereina black mask layer is formed in areas between the organic or inorganic electroluminescence layers of respective colors.

64. An electro-optical device wherein an emitter of a field emission display device is connected to a drain of a thin-film insulated-gate field effect transistor formed of a polycrystalline or monocrystalline thin semiconductor film via the polycrystalline or monocrystalline thin semiconductor film, wherein said thin semiconductor film comprises an annealed low-crystal quality-thin semiconductor film having enhanced crystallization, and wherein the emitter of the field emission display device is formed of an n-type polycrystalline

semiconductor film or an n-type polycrystalline diamond film formed on the polycrystalline or monocrystalline thin semiconductor film.

65. An electro-optical device according to Claim 64, wherein a shield metal film for providing a ground potential is disposed, via an insulating film, on active elements including the thin-film insulated-gate field effect transistor and diode.

66. An electro-optical device according to Claim 65, wherein the shield film is formed using the same material as that of the gate lead electrode of the field emission display in the same processing step as that in which the gate lead electrode of the field emission display is formed.